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A revision of the subfamily Syneurycopinae (Isopoda: Asellota: Eurycopidae) with a new genus and species (*Bellibos buzwilsoni*)

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Abstract. To date, the subfamily Syneurycopinae has accommodated a single genus, *Syneurycope,* and 8 morphologically diverse species. The present taxonomic revision of the subfamily synonymizes 3 of these species, creates a new genus with 2 subgenera, *Bellibos* (*Bellibos*) and *B.* (*Bemerria*), and describes one new species, *Bellibos* (*Bellibos*) *buzwilsoni.* A key to the subfamily is provided. Size-frequency and meristic variability data are provided for a particularly well-sampled species, *B. buzwilsoni.* Biogeographic information is presented, based on material collected from all regions of the Atlantic Ocean. Those species that are known from more than one locality have widespread distributions.

Introduction

The Eurycopidae is one of the largest and most abundant families of deep-sea isopods. As with the other large families, its systematics badly needs revision. The diagnostic features of most of its higher taxa are unclear, likely synonymies go unattended, and a few genera tend to be made the repository for most new species, even though these species represent a range of morphologies well in excess of what a meaningful genus should contain. The present paper is the first of a series whose purpose is to revise the family in a useful way. We begin here with the Syneurycopinae, one of the smaller and more circumscribed of the 4 eurycopid subfamilies.

The genus *Syneurycope* was established by Hansen (1916) as one of a cluster of genera in his Group Eurycopini; *Syneurycope* contained a single species, *Syneurycope parallela.* Barnard (1920) erected a new genus and species, *Ilycthonos capensis,* and included it in an entirely different taxon, the Desmosomatidae (Wolff, 1962), although at the time Barnard recognized that the genus was ". . . perhaps congeneric with *Syneurycope* Hansen, 1916." Menzies (1956) synonymized *Ilychthonos* with *Syneurycope,* retaining the species as *Syneurycope capensis.* He established the family Eurycopidae, including *Syneurycope* as one of 4 genera, and described a new species, *Syneurycope hanseni.* Later, Menzies (1962) described 2 more species, *Syneurycope heezeni* and *Syneurycope multispina.* In his general revision of the Paraselloidea, Wolff (1962) divided the Eurycopidae into 4 subfamilies, including the monogeneric Syneurycopinae. In 1970, Birstein described *Syneurycope affinis.* Most recently, Chardy (1975) added 2 species: *Syneurycope dageti* and *Syneurycope monicae.*

Taken together, this collection of species encompasses a broad range of morphologies. The trunk may be dorsoventrally flattened or strongly vaulted. The cephalon may or may not bear large horns or other distinctive sculpturing. The first pereonite may be fused to the cephalon, or it may be free; it can be equal in size to the other anterior pereonites or much larger. The natasome (Hessler and Thistle, 1975) varies markedly in size relative to the ambulosome. The pleotelson is complexly contoured in some species, simple in others. Accepting the criterion that members of a genus

should look much alike, this suite of species, although related, clearly should be considered representatives of more than one genus. In this paper we have defined two genera: a restricted *Syneurycope* Hansen, 1916, and a new genus, *Bellibos*. The extent of morphological similarity of congeners in each of the two resulting genera is somewhat different. The existence of more than one species in *Syneurycope* is well founded, with differences of the same order seen in genera of other deep-sea isopod families. However, *Bellibos* species encompass a wider range of morphologies than usual; we have therefore split them into 2 natural groupings which we diagnose as the new subgenera, *Bellibos* and *Bemerria*.

We have examined the available types of every published species except for the single Pacific species, *Syneurycope affinis* Birstein, 1970. It became obvious that the independence of *S. capensis* and *S. hanseni* from *S. parallela* could not be supported, and they are synonymized herein. The types of *B. dageti* and *B. monicae* have apparently been lost in the mail between Brest and Paris, France, en route to the National Museum of Natural History (M. M. Forest and P. Chardy, *personal communication*). We describe specimens from our collection that we have tentatively assigned to these 2 species; although our specimens differ from Chardy's descriptions of *B. monicae* and *B. dageti* in a few potentially diagnostic characters, there remains insufficient evidence to describe them as new species. The type-material of *B. multispina* stands as the only collected specimens of this unique species. A new species (*Bellibos buzwilsoni*) is described here which is quite unlike anything seen before. As redefined in this paper then, the Syneurycopinae contains 2 genera, 2 subgenera, and 7 species.

In spite of the morphological breadth of the Syneurycopinae, the subfamily is a strong natural unit. Its diagnosis contains a number of unusual and seemingly unrelated features: the fusion of pereonites 5–7, the absence of maxillipedal coupling hooks, the presence of medial denticles on the third article of the maxillipedal palp, the short branchial chamber, and the apical cleft of the female operculum.

The syneurycopine species most similar to other eurycopids is *B. buzwilsoni*. Compared to other members of the subfamily, it has the broadest, deepest body; the first pereonite is unspecialized and articulates freely with the cephalon; its natasome is the largest, relative to body size; its swimming pereopods (pereopods V–VII) have broad carpi and propodi; the pleotelson shape is simple; and the uropodal rami are both well developed. In general body shape, *B. buzwilsoni* is reminiscent of *Betamorpha* Hessler and Thistle (1975).

Syneurycope parallela is certainly the most specialized species, as seen in its slender body, the complete fusion of pereonite 1 and the cephalon, its short natasome, slender pereopods V–VII, complexly contoured pleotelson, and reduced uropodal exopod. *Bellibos buzwilsoni* and *Syneurycope parallela* bracket most of the morphological variation in the Syneurycopinae. The unique inflated cephalon of *B. multispina* and expanded pereonite 1 of *B. monicae* are the major exceptions to this.

Basically, the syneurycopine species are pan-Atlantic. The distributional map (Fig. 1) shows some gaps in this pattern which may be a result of unequal sampling effort. Only *Bellibos multispina* is restricted to a single station. *Syneurycope heezeni* and *Bellibos dageti* are restricted to the South and North Atlantic, respectively. The other species exhibit impressive horizontal distributional ranges. Although this is not atypical for a family or even a genus, it is unusual for most species of a subfamily to be known to range so widely. The existence of *Syneurycope affinis* extends the distribution of the Syneurycopinae to the Pacific Ocean as well.

The depth distribution is basically abyssal with most species occurring over a range of ≈2000 metres. The major exceptions to this scheme are *B. multispina* and *S. affinis*, known from but a single station, and *S. parallela*, which is very wide-ranging (from 1280 to 5122 metres, a range of nearly 4000 metres).

Materials.—The Woods Hole Oceanographic Institution deep-sea sampling program is the source for most of the material used in this study. This program has sampled, with an epibenthic sled, a series of transects originating on the continental shelf and running out to the abyssal plain. These transects are located off the north-

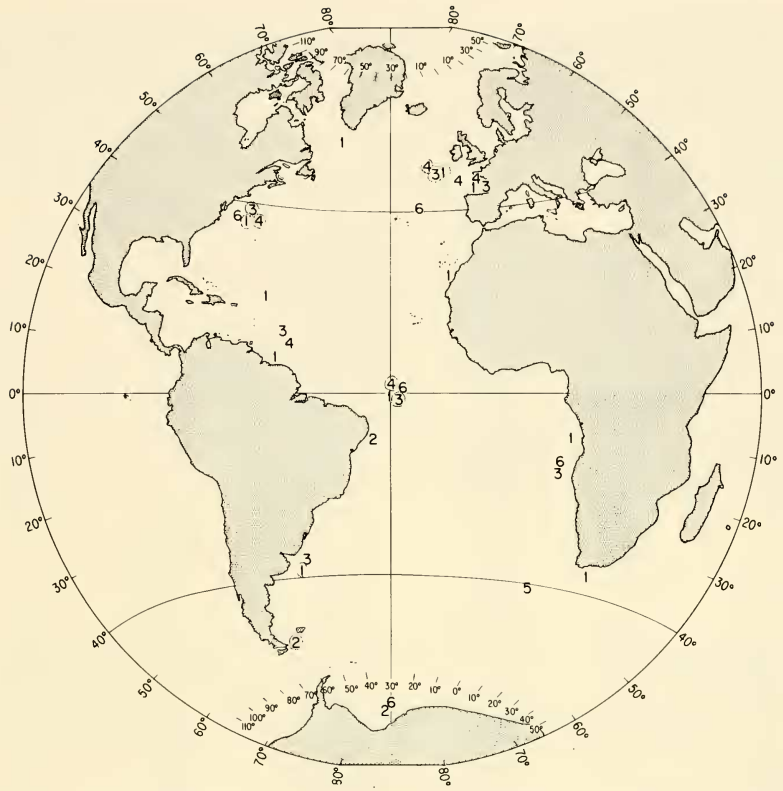

FIGURE 1. Geographical distribution of syneurycopine species in the Atlantic Ocean. Species are symbolized by numbers: 1, *Syneurycope parallela*; 2, *Syneurycope heezeni*; 3, *Bellibos buzwilsoni*; 4, *Bellibos dageti*; 5, *Bellibos multispina*; 6, *Bellibos monicae*. Each number locates a single station except where circled; circled numbers indicate approximate location of a cluster of 2 or more closely spaced stations (*see* **Table 1** for complete listing of station data).

eastern United States (Gay Head–Bermuda transect), Surinam, northern Brazil, Argentina, Namibia, Angola, Senegal, and Ireland. Additional isopod material comes from the Bay of Biscay (J. Allen, University of Newcastle-upon-Tyne), the Canary Islands (J. Allen), and the Weddell Sea (J. Rankin, University of Connecticut). Station data are given in Table 1.

Newly assigned type-specimens are deposited in the United States National Museum (USNM), Washington, D.C. Paratypes and/or additional material are also deposited in the Zoological Museum, University of Copenhagen (ZMUC), Copenhagen, Denmark. The remaining material resides in the second author's working collection at Scripps Institution of Oceanography (SIO), La Jolla, California, but will ultimately be deposited in the USNM.

Methods.—The methods used to collect and treat the samples, and to preserve the animals have been previously described (Sanders et al., 1965; Hessler and Sanders, 1967; Hessler, 1970).

TABLE 1. Station data for the Syneurycopinae of the present study. Species found at each station are listed by number: *1, Syneurycope parallela; 2, Syneurycope heezeni; 3, Bellibos buzwilsoni; 4, Bellibos dageti; 5, Bellibos multispina; 6, Bellibos monicae.* Source abbreviations: Woods Hole Oceanographic Institution (WHOI); Lamont Geological Observatory (LGO); John A. Allen (JA); J. S. Rankin/United States Coast Guard Cutter Glacier (R); Pieter Faure (PF); Danish Ingolf Expedition (IE); Biogas IV/RV Jean Charcot (BIV); Biacores/RV Jean Charcot (B).

Source	Station	Latitude	Longitude	Depth (m)	Species
WHOI	62	39°26.0′N	70°33.0′W	2496	*1*
	63	38°46.8′N	70°05.7′W	2891	*1*
	64	38°46.0′N	70°06.0′W	2886	*1, 3*
	66	38°46.7′N	70°08.8′W	2802	*1, 3*
	71	38°08.0′N	71°47.5′W	2946	*4*
	72	38°16.0′N	71°47.0′W	2864	*1, 6*
	76	39°38.3′N	67°57.8′W	2862	*1*
	100	33°56.8′N	65°47.0′W	4743–4892	*4*
	103	39°43.6′N	70°37.4′W	2022	*1*
	126	39°37.0′N	66°47.0′W	3806	*1, 4*
	131	36°28.9′N	67°58.2′W	2178	*1*
	155	00°03.0′S	27°48.0′W	3730–3783	*3, 4*
	156	00°46.0′S	29°28.0′W	3459	*1, 3, 4, 6*
	195	14°40.0′S	09°54.0′E	3797	*3, 6*
	200	09°41.0′S to 09°43.5′S	10°55.0′E to 10°57.0′E	2644–2754	*1*
	242	38°16.9′S	51°56.1′W	4382–4402	*1*
	245A	36°55.7′S	53°01.4′W	2707	*1, 3*
	256	37°40.9′S	52°19.3′W	3906–3917	*1*
	287	13°16.0′N	54°52.2′W	4934–4980	*3*
	288	11°02.2′N	55°05.5′W	4417–4429	*4*
	303	08°28.8′N	56°04.5′W	2842–2853	*1*
	313	51°32.2′N	12°35.9′W	1491–1500	*1*
	321	50°12.3′N	13°35.8′W	2868–2890	*1, 3*
	323	50°08.3′N	13°50.9′W to 13°53.7°W	3338–3356	*1*
	326	50°04.9′N to 50°05.3′N	14°23.8′W to 14°24.8′W	3859	*1*
	328	50°04.7′N	15°44.8′W	4426–4435	*1, 3, 4*
	330	50°43.4′N	17°52.0′W	4632	*3, 4*
LGO	1	20°32.2′N	60°28.1′W	4941–4959	*1*
	52	41°03.0′S	07°49.0′E	4960	*5*
	200	55°42.9′S	64°21.6′W	3813	*2*
	201	55°31.2′S	64°07.5′W	3839	*2*
	220	09°45.0′S	34°24.0′W	3222–3336	*2*
JA	50	43°46.7′N	03°38.0′W	2379	*1, 3, 4*
	6711	27°14.9′N	15°36.3′W	2988	*1*
R	1969/21 ES	73°52.0′S	31°18.0′W	2288	*2*
	1969/23 ES	72°47.6′S	30°29.7′W	3697	*6*
PF	"Cape Point North 89° East, distant 36 miles [≈58 km]"			1281	*1*
IE	22	58°10.0′N	48°25.0′W	3376	*1*
BIV	2	47°31.0′N	09°09.7′W	2835	*4*
B	245	40°57.0′N	22°16.0′W	4270	*6*

The illustrations were made using a compound microscope equipped with a camera lucida. Measurements were obtained from the drawings. Total body length was measured dorsally from the anterior edge of the cephalon to the posterior tip of the pleotelson, along the midsagittal line. Cephalon and pereonite length were also measured midsagittally; pereonite width was measured transversely at the greatest tergal span. The length of various antennal articles and podomeres was measured along the longest axis; the width was measured perpendicular to the length at the widest span. Uropodal ramal length included that part of the ramus which is embedded in the protopod.

Length:width ratios (hereafter abbreviated l/w) were obtained from these measurements. The reader should be cautioned that the morphological measurements and meristic counts cited in this paper were obtained from a single specimen unless a range of variation is given.

The various types of setae are defined and illustrated in Hessler (1970). "Natasome" refers to pereonites 5–7, pleonite 1 and the pleotelson along with the corresponding appendages (Hessler and Thistle, 1975). The female second pleopod is termed the operculum and frequently possesses a ventral, midsagittal ridge referred to as the "keel." The pleotelson is described as "complexly contoured" when it no longer has a simple undifferentiated shape with gently tapering sides, but exhibits well-defined surface topography with abrupt discontinuities in pleotelson width.

Descriptions and illustrations are based on previously undescribed material from the second author's working collection unless otherwise noted. The identity of these specimens was confirmed by direct comparison with the corresponding holotype. Specific mention is made wherever our material is known to differ from the type-material. The following type-material was examined for this study: (1) American Museum of Natural History, New York: *Syneurycope hanseni* Menzies, 1956, holotype; *Syneurycope heezeni* Menzies, 1962, holotype, paratype and additional material; *Syneurycope multispina* Menzies, 1962, holotype, allotype and paratype. (2) South African Museum, Cape Town: *Syneurycope capensis* (Barnard, 1920), syntypes. (3) Zoological Museum, University of Copenhagen, Denmark: *Syneurycope parallela* Hansen, 1916, holotype.

Systematics

Syneurycopinae Wolff, 1962

Diagnosis.—Eurycopidae with elongate body, l/w >3.0. Pereonites 5–7 fused. Antenna I positioned terminally on cephalon, first article subcylindrical. Maxillipeds lack coupling hooks, may be fused in part; third article of palp with medial denticles; epipod large. Branchial chamber and operculum short with respect to length of pleotelson; ♀ pleopod II (operculum) apically cleft. Uropods biramous, flattened.

Syneurycope Hansen, 1916
Figures 2–6

Synonymy.—*Syneurycope* Hansen, 1916, pp. 130–131; Menzies, 1956, pp. 5–6; Menzies, 1962, pp. 150–151; Wolff, 1962, pp. 108–109, 116–117. *Ilychthonos* Barnard, 1920, pp. 414–415.

Type-species.—*Syneurycope parallela* Hansen, 1916, pp. 131–132, Pl. XII, Figs. 4a–4o.

Distribution.—Eastern and western Atlantic Ocean, 58°10′N to 73°52′S, 1280–5122 m. Northwestern Pacific Ocean, 44°48′N, 5005–5045 m.

Diagnosis.—Syneurycopinae with body l/w always >4.0. Combined length pereonites 1–4 always > pereonites 5–7. Cephalic spines absent; medial dorsal surface cephalon raised; cephalon fused to first pereonite. Pleotelson complexly contoured. Antenna I, ♀ flagellum a single article. Pereopod V carpus slender where known; l/w >2.5. Female operculum widest in proximal half, tapering distally; median keel poorly developed. Pleopod I, adult ♂ with outer ramus of distal end unusually elongate, equal in length to that of inner ramus, where known. Pleopod II, adult ♂ with distal tip of protopod elongate, extending distally far beyond exopod, where known. Uropod with strongly reduced exopod bearing 1 or 2 large, apical setae; length exopod ⅓ or less length endopod.

Additional description.—The characteristically elongate pereopods III and IV of *Syneurycope parallela* are now known for *S. heezeni* also. The merus, carpus, propodus, and dactylus are all greatly elongated, with carpus l/w > 10 and propodus l/w

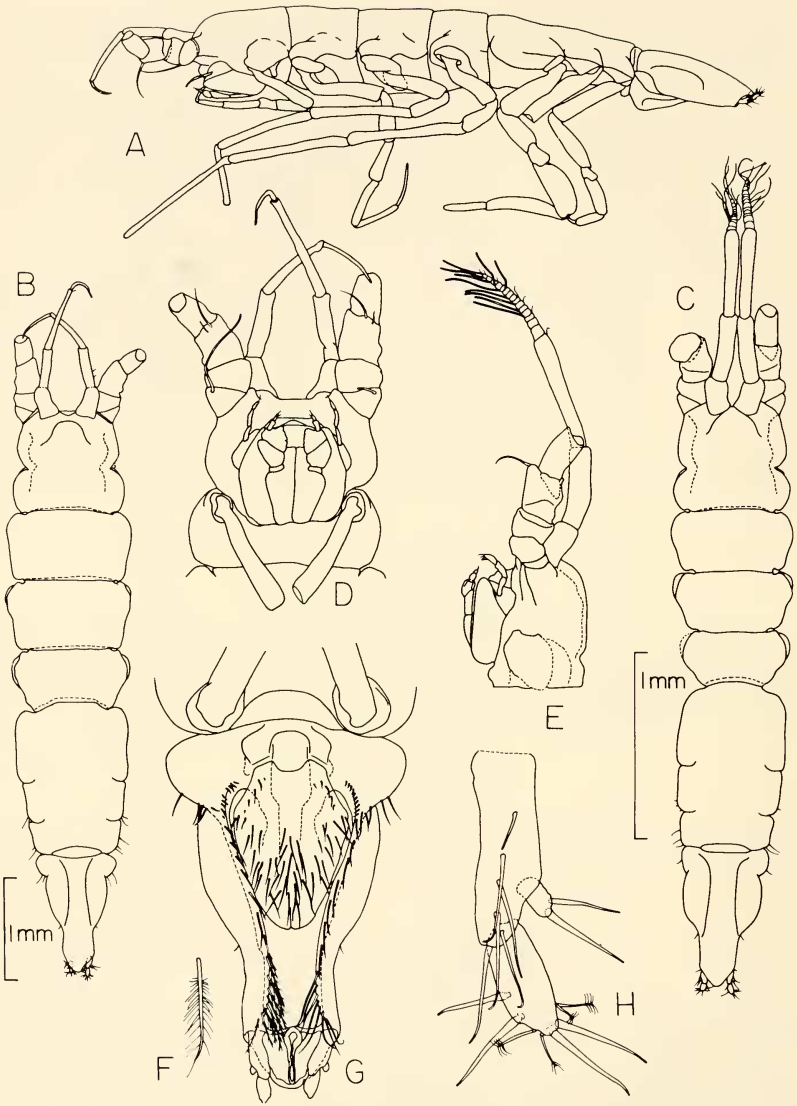

FIGURE 2. *Syneurycope parallela* preparatory ♀, WHOI 131: A. body, lateral view, setae omitted; B. body, dorsal view; D. cephalon-pereonite 1, ventral view; F. plumose seta, enlarged view, typical of setae on operculum and posterior medial margins of pleotelson; G. pleotelson, ventral view, setae omitted from uropod and edge of operculum; H. left uropod, ventral view, *in situ*. Male, WHOI 131: C. body, dorsal view; E. cephalon-pereonite 1, lateral view, pereopod I missing.

>20. This character is not diagnostic of *Syneurycope* because it remains unknown for most other syneurycopine species; it is likely to be diagnostic of the subfamily.

Remarks.—*Syneurycope* species are readily identifiable by the elongate body, the fusion of cephalon and first pereonite, the absence of cephalic horns, and the short uropodal exopod. One other syneurycopine species, *Bellibos monicae*, shares the general body proportions of *Syneurycope*; however, other features clearly differentiate it from this genus.

Hansen's original generic description is accurate only for the single species on which it was based, *Syneurycope parallela*. None of the later treatments of the genus are concise; they include specific and familial characters.

The genus has previously been made recipient of 8 species: *Syneurycope parallela* Hansen, *S. capensis* (Barnard), *S. hanseni* Menzies, *S. heezeni* Menzies, *S. affinis* Birstein, *S. multipsina* Menzies, *S. dageti* Chardy, and *S. monicae* Chardy. The present revision synonymizes the first 3 species with *S. parallela* and removes the last 3 species to a new genus. This leaves *Syneurycope* with 3 species: *S. parallela*, *S. heezeni* and *S. affinis*.

Syneurycope parallela Hansen, 1916
Figures 2–3

Synonymy.—*Syneurycope parallela* Hansen, 1916, pp. 131–132, Pl. XII, Figs. 4a–4o; Menzies, 1962, pp. 150–151, Fig. 41F; Wolff, 1962, pp. 116–117. *Ilychthonos capensis* Barnard, 1920, pp. 415–416, Pl. XVII, Figs. 14–16. *Syneurycope capensis* Menzies, 1956, pp. 5–6. *Syneurycope hanseni* Menzies, 1956, p. 6, Fig. 2.

Holotype.—Ingolf Station 22 (58°10′N, 48°25′W); ZMUC, ♂, 3.7 mm. Specimen in excellent condition; left maxilliped and left mandible dissected off, former lost and latter mounted on slide.

Other material.—*Syneurycope capensis* syntypes: "Cape Point North 89°E, distant 36 miles" (Barnard, 1920), SAM A4030. Subadult ♀ without uropods. Preparatory ♀ with single uropod, no pleopods. Badly damaged ♂, pleopods I present, no uropods. Fragment: cephalon and anterior 7 pereonites, pereopod I present. Fragment: pleotelson with uropod. Fragment: middle 6 pereonites, pereopod II present but detached. *Syneurycope hanseni* holotype: tropical Atlantic (20°32.2′N, 60°28.1′W), AMNH 11758, ♂, 3.8 mm. Specimen in very poor condition, flattened and badly decalcified. Absent limbs include: antennae II, maxilliped, and pereopods II, III, and IV. No additional material. Present collection: WHOI stations 62 (1 individual); 63 (2); 64 (17); 72 (1); 76 (5); 103 (5); 126 (1); 131 (60); 156 (5); 200 (1); 242 (6); 245A 20% fraction (26); 256 (7); 313 (8); 321 (83); 232 (7); 326 (4); 328 (2). John Allen stations 48 (1); 50 (199); 6711 (1). Illustrated preparatory ♀ and copulatory ♂ (WHOI 131) deposited at ZMUC. Copulatory ♂ (WHOI 103), copulatory ♂ (WHOI 62), preparatory ♀ (WHOI 66) and brooding ♀ (WHOI 131) USNM catalog nos. 173001, 173003, 173002, 173000, respectively.

Distribution.—Eastern and western Atlantic Ocean, 58°10′N to 38°17′S, 1280 to 5122 m.

Diagnosis.—*Syneurycope* with narrow body; body length preparatory female 4.4–4.6× tergal width of pereonite 2; not fringed laterally with numerous simple setae. Pleotelson with pair of strongly flaring, proximal ventral flanges, paired dorsolateral bulbous midsections, and narrow drawn-out distal end. Antenna 1, ♀, first article approximately same width as second article, l/w >1.7; first 2 articles not fused although articulation is reduced; second article inserts centrally into first as their widths are approximately equal at this junction. Mandibular incisor process with 3–4 more or less distinct teeth; molar process truncate with marginal row of setae. Maxillipedal epipod pointed distally. Pereopod V carpus l/w 2.8; dactylus slender. Female operculum, apical cleft <1/5 length of operculum. Uropodal endopod with 2 large apical setae and 2 stout lateral setae; exopod bears 2 apical setae.

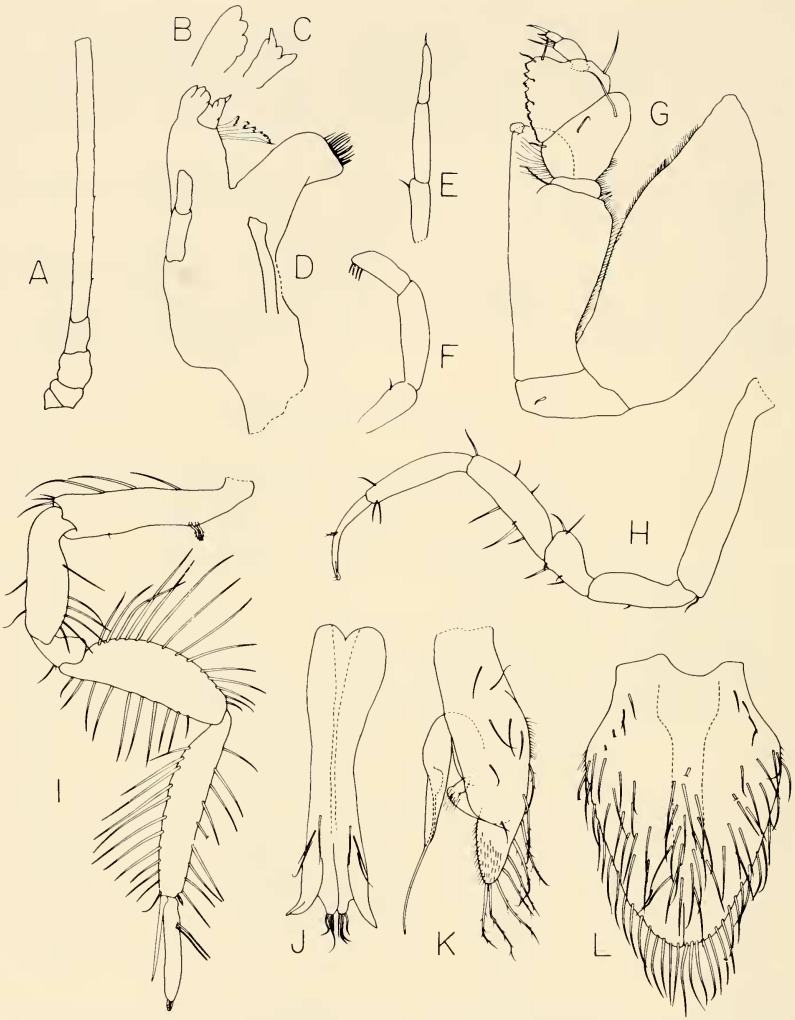

FIGURE 3. *Syneurycope parallela* ♂, WHOI 103: A. left antenna II, *in situ*, flagellum absent. Preparatory ♀, WHOI 131: B. incisor process, mandible, plan view; C. lacinia mobilis, mandible, plan view; D. left mandible, third article of palp absent; E. left mandibular palp; G. left maxilliped; L. operculum, setae are all plumose. Copulatory ♂, WHOI 62: F. left mandibular palp; H. left pereopod I, *in situ*; I. left pereopod V, *in situ*, setae are plumose; J. pleopods I; K. left pleopod II.

Additional description.—Preparatory ♀ larger than copulatory ♂: body length ♀5.5 mm, width 1.2 mm; body length ♂ 3.1 mm, width 0.6 mm; body length copulatory ♂ 4.9× tergal width of pereonite 2. Body widest at pereonite 2: l/w 0.6 preparatory ♀, 0.5 copulatory ♂. Antenna I, ♂ flagellum multiarticulated; bases of antennae I nearly touching in ♂, separated by a shallow depression in ♀. Mandibular palp, ♀,

apical article reduced with single apical seta; apical article, ♂, palp robust with approximately 4 setae.

Remarks.—*Syneurycope parallela* is easily distinguished from *S. heezeni* by the narrower body, the antenna I peduncle, and the exaggerated topography of the pleotelson. It can be differentiated from *S. affinis* by the condition of the molar process of the mandible. The setation of the uropodal endopod is also distinct.

The single discrepancy between our material and Hansen's holotype is the number of setae on the natatory pereopods. Individual or geographic variation, ontogenetic development, and/or damage can easily account for this.

There are some problems with Hansen's description and illustrations. The cephalon is illustrated by Hansen as articulating with the first pereonite. Careful examination of the holotype and Scripps Institution of Oceanography specimens definitely indicates fusion of these 2 structures; no suture line is visible (Fig. 2B). This is a diagnostic feature of the genus in the present revision. Hansen illustrates coupling hooks on the maxilliped; coupling hooks are absent from all specimens examined throughout the entire subfamily (Fig. 3G). The holotype retains only the right maxilliped, the left having been dissected off and subsequently lost. Examination of the single remaining maxilliped on the holotype reveals no coupling hooks. Hansen correctly describes the male as "more than five times as long as the breadth of the fourth thoracic segment." Our male body l/w of 4.9 is obtained by measuring the width of the second pereonite, as this is usually the broadest pereonite throughout the subfamily; measuring width at the fourth pereonite gives a l/w of 5.8. Hansen noted that the operculum "is very far from reaching the end of the abdomen" (Fig. 2G); this becomes a diagnostic feature of the subfamily in the present revision. The antenna I female peduncle consists of 3 articles of the same rough proportions as described by Hansen for the male (Figs. 2D, 2E). The 16 articles of the antenna I flagellum he describes are typical of the male only; the female flagellum is a single segment (Fig. 2D).

Sexually dimorphic characters are not presently included in the species diagnosis because no male *S. heezeni* or *S. affinis* has been collected.

The antenna II fifth article is extremely elongate (Fig. 3A). This article is rarely present on collected specimens.

In this revision, *Syneurycope parallela* Hansen, *S. capensis* (Barnard), and *S. hanseni* Menzies are synonymized. The type-specimens of all 3 species were carefully examined; all proved indistinguishable from *S. parallela*. They were simply poorly illustrated and wrongly described. When circumstances dictated, we reillustrated the type-material. All problems and errors in the literature are treated below.

Syneurycope capensis
Figure 4: Barnard's syntypes reillustrated

Barnard's description contains many inaccuracies. Confusion results from his neglect to specify which of the 6 syntypes he has described. Barnard illustrated the first pereonite as discrete, yet careful inspection of the types shows it is fused with the cephalon (Fig. 4A). Pereonites 5, 6, and 7 are also illustrated as separate segments, but they are actually fused (Fig. 4A), as is typical of all species of Syneurycopinae. Barnard described a "pleon of a single segment"; the types actually have a reduced first pleonal segment, apart from the pleotelson (Figs. 4A, 4F). The antenna I flagellum is described as bearing "ca. twelve indistinctly separated joints" (Fig. 4B); this is true in the male alone, the female bears a flagellum of a single article (Fig. 4A). Furthermore, it indicates the immature condition of the male syntype, because adults typically bear closer to 16 articles. Additional evidence for an immature male syntype includes the truncate condition of the indistinctly bilobed distal end of the first pleopod (Fig. 4G), a second pleopod with a very stout stylet, and the feminine condition of the mandibular palp (Fig. 4D). The uropod is biramous, although described by Barnard as uniramous. The small exopod, $\approx 1/5$ the length of the endopod, is easily overlooked (Fig. 4E). The remaining discrepancies between *S. parallela* and *S. capensis* involve the man-

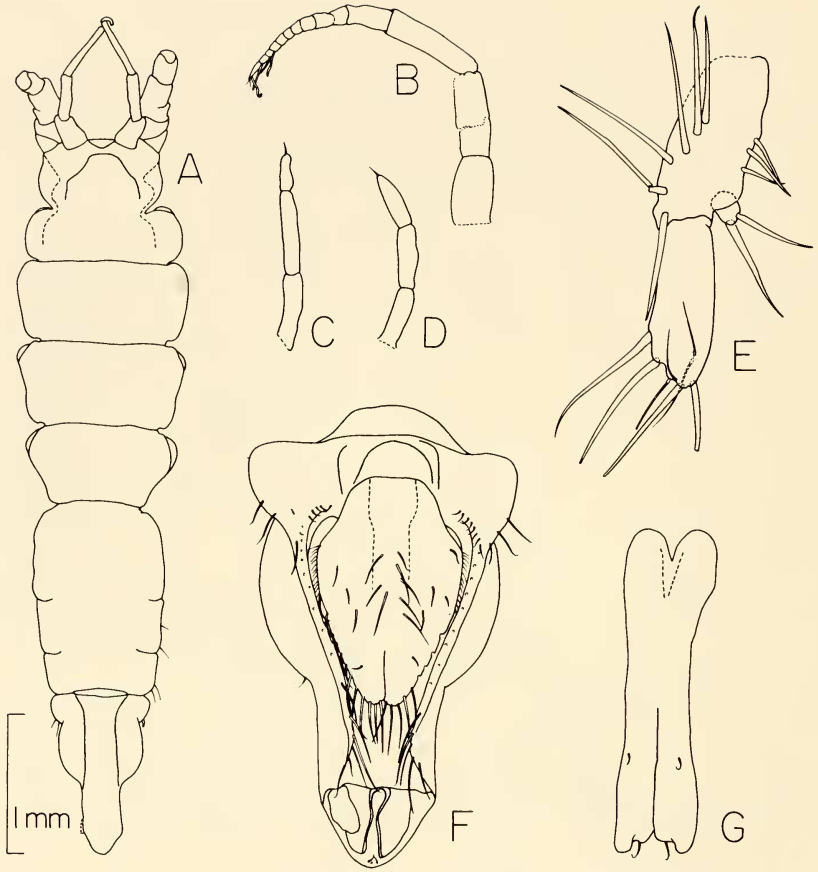

FIGURE 4. *Syneurycope parallela* (reillustration of Barnard's *Syneurycope capensis* syntypes, S.A.M. A4030) preparatory ♀: A. body, dorsal view, left distal edge of pleotelson damaged; C. left mandibular palp, *in situ*; E. left uropod, ventral view, *in situ*, setae are plumose. Nonpreparatory ♀: F. pleotelson, ventral view, setae are plumose, setae omitted from medial margins of pleotelson and left edge operculum, uropods missing. Immature ♂: B. left antenna I, *in situ*, second article damaged; D. left mandibular palp, *in situ*; G. pleopods I, *in situ*.

dible and maxilliped, which are unavailable. Barnard describes the mandible with a "secondary cutting edge [as] bifid." Presumably he is referring to the lacinia mobilis, which does appear bifid in lateral view, but is clearly quadradentate in plan view in *S. parallela* (Fig. 3C). Barnard describes the maxilliped as bearing an "inner distal margin of fifth [=third article of palp] with three denticles." In *S. parallela*, this margin is armed with numerous irregular spiniform teeth (Fig. 3G); these small teeth are grouped into units, which Barnard refers to as denticles. The number of denticles present varies both ontogenetically and between individuals. They are prominent and discrete distally, progressively diminishing in size and becoming less distinct proximally. The number of denticles varies too much to be useful as a diagnostic or descriptive character. The presence of numerous denticles along this margin is typical of all syneurycopine

species. Data on the variability of this character are included in the treatment of *Bellibos buzwilsoni,* sp. nov.

Syneurycope hanseni

In 1956, Menzies described *S. hanseni.* Reexamination of the holotype demonstrated that it is a poorly preserved specimen of *S. parallela.* We have not reillustrated the holotype; Menzies' drawings (Menzies, 1956b, Fig. 2) can be directly compared with our *S. parallela* illustrations, with the corrections indicated below.

The holotype is originally illustrated as having a discrete cephalon and pereonite 1; our examination reveals that they are fused. The basal pleonite is distinct; the partial sutures in Menzies' drawings are incorrect. The original diagnosis contains other minor discrepancies. It includes the presence of "a well-developed mandibular palp" as a diagnostic character, but in the female it is reduced. The presence of "sixteen denticles along inner margin of second article" of the maxillipedal palp is also cited as diagnostic. Presumably, Menzies is referring to the third and not the second article, the variability of which has already been discussed. Menzies' terminology differs from Barnard's: a denticle now refers to a single projection or tooth. Reexamination of the holotype yields a different count from that of Menzies. Menzies' illustration depicts each male pleopod I inner ramus with 3 apical setae; close inspection of the type indicates a fourth seta broken off each ramus. Furthermore, Menzies' illustration lacks the simple setae present on the ventral surface of this appendage. The *S. hanseni* holotype is definitely a copulatory male as indicated by the form of the second pleopodal stylet, yet the antennular flagellum is described as having 10 articles, as opposed to approximately 16 on adult *S. parallela* males. This discrepancy may be real or is perhaps attributable to the difficulty of discerning whether or not flagellar articles are fused on a poorly preserved, decalcified specimen. The uropod illustrated by Menzies has fewer stout setae than that of *S. parallela.* Inspection of the uropod indicates that it has been compressed out of shape, such that setae could easily have been dislodged.

There have been no recent finds of *S. capensis* or *S. hanseni,* although much collecting has been done. We believe all of the above evidence strongly indicates the synonymy of these species with *S. parallela.*

Syneurycope heezeni Menzies, 1962
Figures 5 and 6

Synonymy.—*Syneurycope heezeni* Menzies, 1962, p. 151, Figs. 41A–E; Wolff, 1962, pp. 116–117.

Holotype.—L.G.O. Biotrawl No. 200 (55°42.9′S, 64°21.6′W); AMNH 12132, preparatory ♀, 4.5 mm.

Paratype.—L.G.O. Biotrawl No. 200 (55°42.9′S, 64°21.6′W); AMNH 12133, ♀.

Other material.—L.G.O. Biotrawl No. 201 (55°31.6′S, 64°07.5′W); AMNH 12280, 2 ♀♀; 1 ♀ anterior body fragment, 1 ♀ midbody fragment. L.G.O. Biotrawl No. 220 (9°45.0′S, 34°24.0′W); AMNH 12281, ♀. Present collection: 1969 Rankin Station No. 21, epibenthic sled (9 individuals); 2 preparatory ♀♀ (no. 1 and no. 2) deposited at ZMUC.

Distribution.—Southwest Atlantic Ocean and Weddell Sea, 9°45.0′S to 73°52.0′S, 2288–3839 m.

Diagnosis.—*Syneurycope* with broad body; body length 4.1 (♀) × tergal width of pereonite 2; body fringed laterally with numerous simple setae. Pleotelson contouring less complex than that of *S. parallela*: proximal ventral flanges less flaring, distal end less produced. Antenna 1, ♀, first article wider than second, l/w 1.3; first 2 articles fused; first article much wider than second at their junction; second article inserts toward medial edge of first. Mandibular incisor process with 5 distinct teeth; molar process truncate with marginal row of setae. Maxillipedal epipod rounded distally. Pereopod V carpus l/w 2.7; dactylus paddle-shaped. Female operculum apical cleft

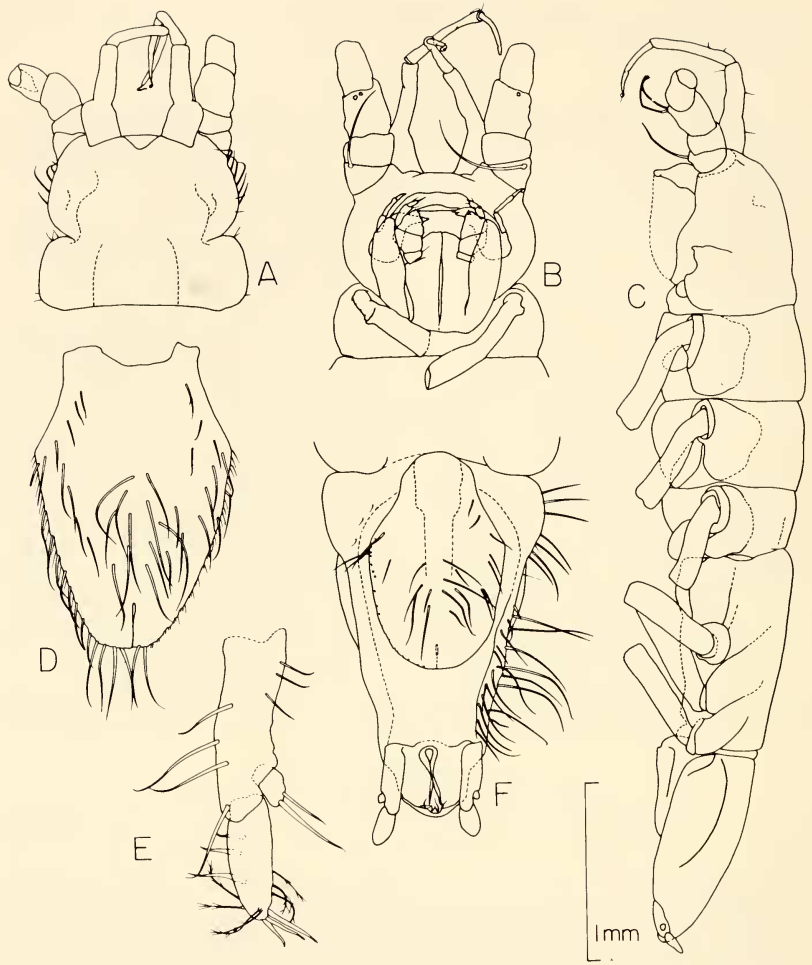

FIGURE 5. *Syneurycope heezeni* holotype ♀, L.G.O. Biotrawl 200 (AMNH 12132): A. cephalon-pereonite 1, dorsal view; C. body, lateral view, setae omitted from appendages, mouthfield simplified; F. pleotelson, ventral view, setae omitted from edge of operculum, right medial edge of pleotelson, and uropods, all setae are plumose. Preparatory ♀ no. 2, 1969 Rankin station 21, epibenthic sled (ES): B. cephalon-pereonite 1, ventral view, right pereopod damaged. Preparatory ♀ no. 1, 1969 Rankin station 21, ES: D. operculum, only bases of setae illustrated along left edge, all setae are plumose; E. left uropod, ventral view, *in situ*.

$<1/5$ length of operculum. Uropodal endopod with 3 large apical setae and 3 stout lateral setae; exopod bears 2 apical setae.

Additional description.—Body length ♀ 4.4 mm, width 1.1 mm. Body widest at pereonite 2, preparatory ♀ l/w 0.5.

Remarks.—*Syneurycope heezeni* is readily distinguished from its congeners by the distinctly broader body; the unique antenna I peduncle (Fig. 5A–C); and the setation of the uropodal endopod (Fig. 5E). It differs further from *S. affinis* by bearing a row of setae on the molar process of the mandible.

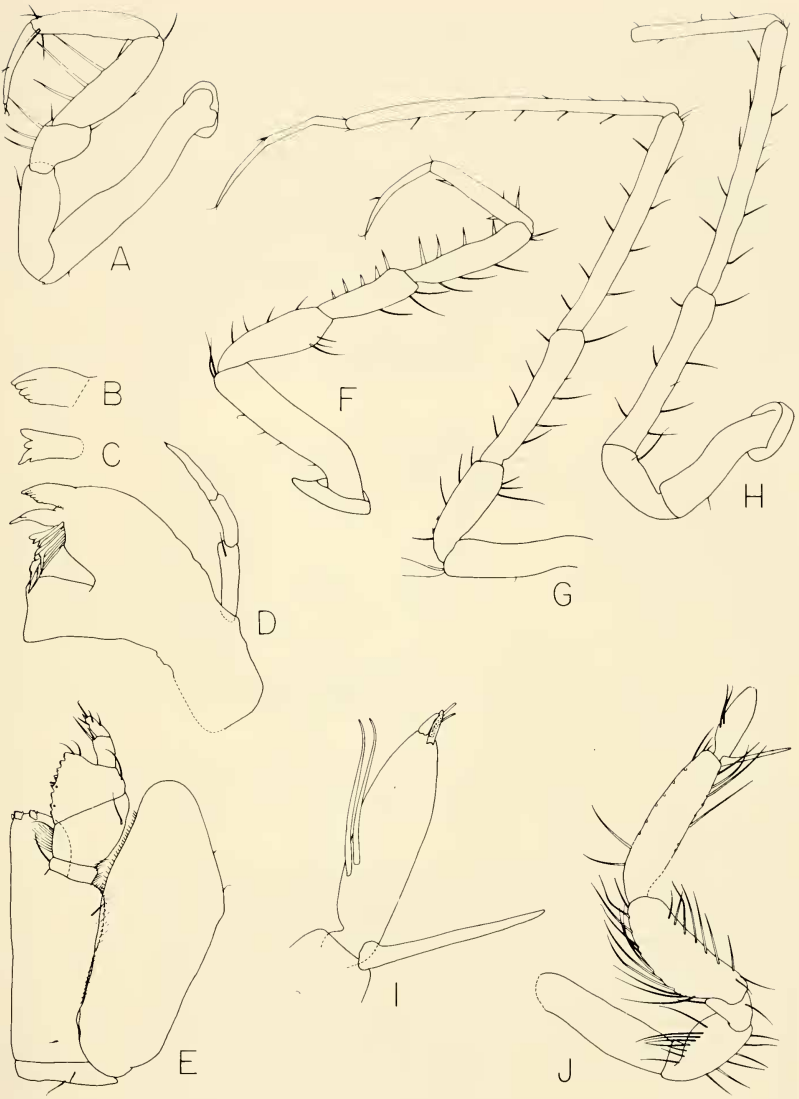

FIGURE 6. *Syneurycope heezeni* preparatory ♀ no. 2, 1969 Rankin station 21, ES: A. left pereopod I, *in situ*. Preparatory ♀ no. 1, 1969 Rankin station 21, ES: B. incisor process, mandible, plan view; C. lacinia mobilis, mandible, plan view; D. left mandible, setal row on distal edge of molar process not visible in this view; E. left maxilliped. Preparatory ♀, holotype, L.G.O. Biotrawl 200 (AMNH 12132): F. left pereopod II, *in situ*; G. left pereopod III, *in situ*; H. left pereopod IV, *in situ*; I. dactylus, pereopod V, enlarged; J. left pereopod V, *in situ*, tip of dactylus omitted.

Menzies' description and illustrations of *S. heezeni* are inadequate for modern requirements. We have therefore reillustrated it, drawing from both type-material and our working specimens, as circumstances dictated. For the most part, the original description refers to higher level characters. The fusion of the cephalon and first pereonite (Figs. 5A and 5C) is not unique to *S. heezeni*, but is diagnostic for the genus. The presence of a discrete first pleonal somite (Fig. 5C) and the absence of maxillipedal coupling hooks (Figs. 5B, 6E) are features of the Syneurycopinae. Menzies (1962) cites the absence of an apical seta on the distal article of the mandibular palp, but it is so small that he probably overlooked it (Fig. 6D). The relative proportions of the uropodal rami are characteristic of the genus; a precise ratio is difficult to establish because of both insufficient standardization of measuring technique and true variability. The approximate length ratio of exopod:endopod is 0.3 for the genus; Menzies cites 0.25 for *S. heezeni*, 0.20 for *S. parallela*, and 0.33 for *S. hanseni*; Birstein cites 0.33 for *S. affinis*. The available data indicate that the true ratio varies between 0.2 and 0.3 regardless of species.

The present revision is based on female specimens alone as males have not yet been collected.

Syneurycope affinis Birstein, 1970

Holotype.—Vityaz Station 5620 (44°48′N, 156°33′E): preparatory ♀, 4.8 mm.

Distribution.—Northwestern Pacific Ocean, 44°48′N, 5005–5045 m (known only from type-locality).

Diagnosis.—*Syneurycope* with narrow body; body length preparatory ♀ ≈4.6–4.7× tergal width of pereonite 2. Pleotelson complexly contoured, similar to that of *S. parallela*. Antenna I ♀ first article subequal in width to second article. Mandibular incisor process 4-toothed; molar process large with "rounded anterior margin and a characteristically curved grinding surface"; mandibular palp, ♀, lacking apical seta. Maxillipedal epipod rounded distally. Female operculum, apical cleft ¼ the length of operculum. Uropodal endopod bears 5 marginal setae; exopod with a single apical seta.

Additional description.—Body length, preparatory ♀, 4.8 mm, width 1 mm. Body widest at pereonite 2, preparatory ♀ l/w 0.5.

Remarks.—*Syneurycope affinis* appears to differ from its congeners by the characteristic form of the mandibular molar process, the number of incisor teeth, the absence of an apical seta on the mandibular palp, the extent of the apical opercular cleft, and the setation of the uropod.

Birstein (1970) compares *S. affinis* to *S. heezeni* as the most similar *Syneurycope* species. Although we were unable to examine the holotype and sole specimen of *S. affinis*, from Birstein's description and illustrations, we feel *S. affinis* more closely resembles the type-species for the genus, *S. parallela* Hansen. Both possess the narrow, elongate body and the unmodified antenna I peduncle. Birstein cites "a constriction between the anterior and posterior halves of the body" as a unique feature of *S. affinis*. We have seen a similar condition on some *S. parallela* specimens and believe this to be an artifact of preservation. The most outstanding difference, as we see it, is the grinding surface on the molar process of the mandible. This condition of the molar process, as described by Birstein (1970), is previously unknown in the asellote isopods and deserves more study when additional material of *S. affinis* is collected. The other differences, listed above, are subtle ones and the examination of additional specimens may even obscure them when the ranges of morphological variability for these particular characters are known.

Bellibos, gen. nov.
Figures 7–13

Synonymy.—*Syneurycope* (pars.) Chardy, Menzies.

Type-species.—***Bellibos* (*Bellibos*) *buzwilsoni***, gen. et sp. nov., Figs. 7–8.

FIGURE 7. *Bellibos (Bellibos) buzwilsoni*, sp. nov., preparatory ♀, WHOI 66: A. body, dorsal view; B. body, lateral view; C. cephalon-pereonite 2, ventral view; D. left uropod, ventral view, *in situ*; E. pleotelson, ventral view, uropods missing, long setae on operculum are plumose, semicircles indicate setae not illustrated; F. operculum, setae on right distal edge omitted for clarity.

Distribution.—Eastern and western Atlantic Ocean, 50°43.4′N to 72°47.6′S, 2379–4980 m.

Etymology.—*bellus*, Latin, charming, pretty; *bos*, Latin, can be construed to mean "buffalo."

Diagnosis.—Syneurycopinae with body l/w usually <4.0. Combined length pereonites 1–4 usually < pereonites 5–7. Paired cephalic spines (=horns) present dorsally; cephalon demarked from first pereonite by a complete suture, articulation may be restricted. Topography of pleotelson simple; width tapers gradually from proximal to distal end. Antenna I ♀ flagellum multiarticulate where known; l/w first article < 2.0. Female operculum widest midway or in distal half; rounded distally; median keel may be well developed. Pleopod I adult ♂ with outer ramus of distal end shorter than that of inner ramus. Adult ♂ pleopod II exopod located at distal tip of protopod. Uropod with well-developed exopod where known, setation variable; length exopod at least ⅔ length endopod.

Remarks.—*Bellibos* species are identifiable by the presence of one or more pairs of cephalic spines, a complete suture line between the cephalon and pereonite 1, and a well-developed uropodal exopod. These characters will allow identification of the genus, although there is great morphological variability between congeners. Body shape varies from deep and robust to flat and fusiform; in one species the cephalon is greatly expanded and in another the first pereonite is expanded. These morphologies could have been as easily assigned to 4 monotypic genera; however the taxonomy would have become unnecessarily complicated without good purpose.

Within the genus, one species, *Bellibos monicae,* stands apart from all the rest. It is the sole exception to several otherwise firm diagnostic traits: its body l/w is almost always >4.0; the combined length of its pereonites 1–4 is > pereonites 5–7; articulation at the cephalon–first pereonite border is reduced; its uropodal exopod is shorter than the endopod, whereas in all other species the rami are equal. In order to group the most similar species together, we have therefore created 2 subgenera: *Bellibos,* which includes *B. buzwilsoni, B. dageti* and *B. multispina,* and *Bemerria* for the single species, *B. monicae.*

Bellibos, subgen. nov.
Figures 7–11

Type-species.—***Bellibos (Bellibos) buzwilsoni,*** sp. nov., Figs. 7–8.

Distribution.—Eastern and western Atlantic Ocean, 50°43.4′N to 41°03.0′S, 2379–4980 m.

Diagnosis.—*Bellibos* with combined length pereonites 1–4 < pereonites 5–7. Cephalon articulates freely with first pereonite. Uropodal rami equal in length where known.

Remarks.—Bellibos (*Bellibos*) includes 3 species: *B. buzwilsoni, B. dageti* and *B. multispina.*

Bellibos (Bellibos) buzwilsoni, sp. nov.
Figures 7 and 8

Holotype.—WHOI Station 321 (50°12.3′N, 13°35.8′W): USNM, 173004, ♂, 4.5 mm.

Paratypes.—WHOI 321, preparatory ♀ fragment, USNM 173005; WHOI 321, immature ♀, USNM 173006; WHOI 321, copulatory ♂, ZMUC; WHOI 321, preparatory ♀, ZMUC.

Other material.—Present collection. WHOI stations 64 (10 individuals), 66 (4); 155 (4); 156 (1); 195 (1); 245A (12); 287 (1); 321 (810); 328 (11); 330 (1). John Allen station 50 (28). Illustrated preparatory ♀ (WHOI 66) and ♀ fragment (WHOI 66) USNM 173008 and 173007, respectively.

Distribution.—Eastern and western Atlantic Ocean, 50°43.4′N to 36°55.7′S, 2379–4980 m.

Etymology.—In honor of our colleague, Mr. George (“Buz”) Wilson.

Diagnosis.—*Bellibos* with deep, robust body; body length 3.1 (preparatory ♀), 3.9 (copulatory ♂) × tergal width of pereonite 2. Single pair of pointed cephalic horns present, without apical setae; cephalon not expanded in length dorsally relative to first

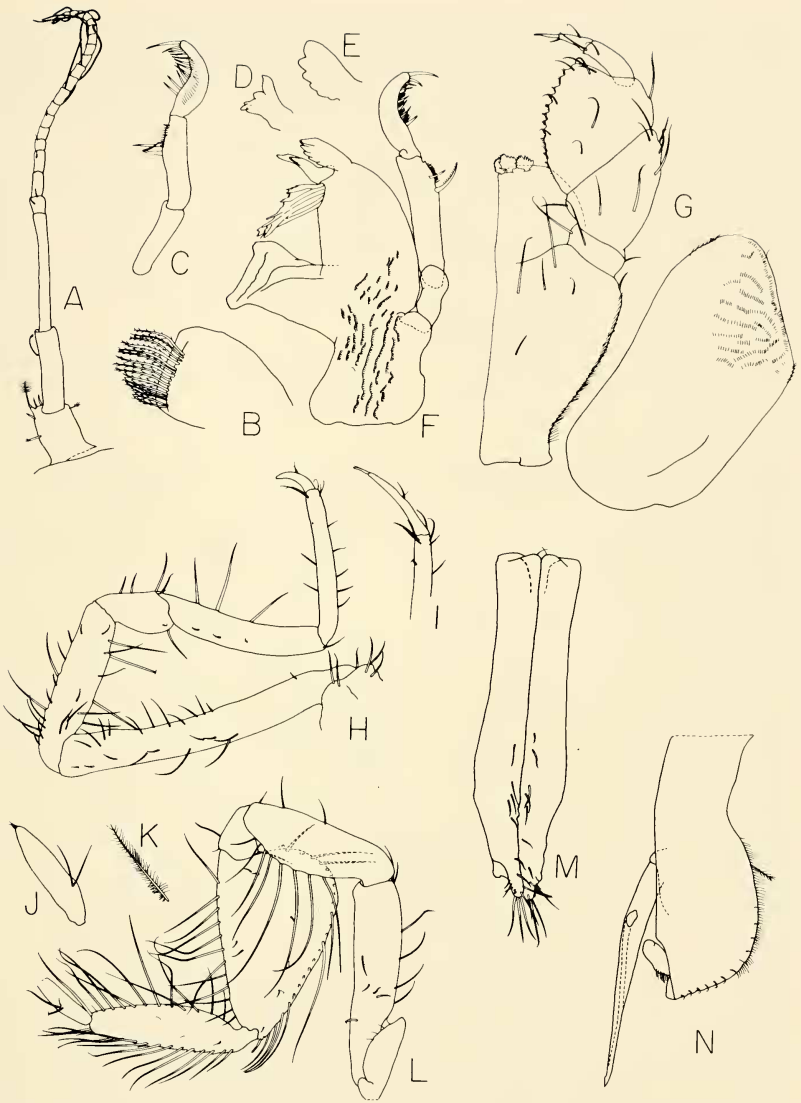

FIGURE 8. *Bellibos* (*Bellibos*) *buzwilsoni*, sp. nov., copulatory ♂, holotype, WHOI 321: A. left antenna I, *in situ*; C. left mandibular palp, *in situ*; M. pleopods I, damaged, distal end twisted; N. left pleopod II. Preparatory ♀, WHOI 66: B. molar process, mandible, enlarged view; D. lacinia mobilis, mandible, plan view; E. incisor process, mandible, plan view; F. left mandible, setae on molar process obscured in this view; G. left maxilliped, epipod detached. Preparatory ♀, paratype, WHOI 321: H. left pereopod I, *in situ*, dactylus foreshortened; I. dactylus, pereopod I, true length. Nonpreparatory ♀, paratype, WHOI 321: J. dactylus, right pereopod VI; K. long, slender plumose seta, typical of setae on pereopod V, carpus and propodus; L. left pereopod V, *in situ*, dactylus damaged.

pereonite. Dorsum of cephalon and pereonites 1–4 dense with simple setae. Pereonite 1 not embracing cephalon dorsolaterally. Pleotelson width at level of uropod insertion ¾ that of proximal end. Antenna I, second article length about 1.5× that of first article; number of articles known to vary from 6 to 8 in preparatory ♀, 12 to 23 in copulatory ♂. Mandibular incisor process with 6 teeth; palp apical article well developed in both sexes, number of setae varies from 6 to 16. Maxillipedal epipod short with blunt, rounded distal end; simple setae present on surface. Pereopods I–IV with undeveloped coxal plates; bases of unequal length: pereopods III and IV robust, ≈3/5 length pereopod II; pereopod I more slender than pereopod II and 4/5 its length; pereopod II with row of stout setae along posterior margin of bases. Pereopod V carpus l/w 1.4. Female operculum pear-shaped; keel well developed, with setae; additional transverse row of extremely long, slender setae present on ventral surface just distal to end of keel. Male pleopod 1 well developed. Robust uropod with broad protopod and exopod; exopod approximately 1.5× endopod in width.

Additional description.—Body length 4.3–7.1 mm preparatory ♀, width 1.3 mm illustrated ♀; body length copulatory ♂ 3.1–5.0 mm, width 1.1 mm holotype ♂. Pereonite 2 l/w 0.3 in adults of both sexes. Antenna 1 second article l/w <4.0.

Remarks.—Bellibos buzwilsoni is easily recognized by its single pair of cephalic horns, the dense setation on the anterior half of the body, the unequal lengths of pereopod bases I–IV, and its robust uropod. This species is well sampled in the Atlantic Ocean; in particular, WHOI station 321 yielded 186 whole-bodied individuals. (Our work was already in progress when this sample was received. For this reason, the illustrated and diagnosed female is not from the type locality.) Such a large sample size permitted analysis of the size-frequency distribution of postmarsupial developmental stages (Fig. 14) and the variability of key morphological characters (Table 2). Developmental terminology follows Hessler (1970).

Size-frequency analysis indicates the presence of 3 manca stages; sex is undifferentiated in the first 2. Morphologically, manca 1 individuals are difficult to separate from the next stage. The anlage of pereopod VII is visible on manca 2 individuals; it can be developed to various degrees, presumably because the still soft limb continues to develop internally during the intermolt period. Manca 3 individuals possess a rudimentary seventh pereopod which varies from an unsegmented, wrinkled appendage to a partially segmented, firm limb. Sexes are now discernible: males exhibit rudimentary first pleopods, ⅓–½ the length of the opercular second pleopod; females possess an operculum of juvenile development, that is, with few setae and no keel. At least 2 more molts exist in males on morphological grounds, although the size-frequency analysis is inconclusive. Juvenile males possess a first pleopod equal in length to the second, although the rami of the distal end of the now paired first pleopods are not yet fully developed, and the second pelopodal stylet is short and blunt. Copulatory males exhibit a well-developed pleopod I and an elongate, tapering second pleopodal stylet bearing a complete duct. The large size range of these stage 5 males indicates that there may be more than one instar. Although the data are insufficient, size-frequency analysis suggests the existence of 3 female juvenile stages. Juvenile 2 is poorly documented, yet a consideration of likely instar size ranges indicates its existence. Morphologically, the first 2 stages are difficult to differentiate: juveniles 1 usually bear 2 setae whereas juveniles 2 bear approximately 5 setae on the apex of the opercular keel. Although the oostegites remain undeveloped in both stages, one of two juvenile 2 individuals has a distinct bud of tissue within its anterior coxae, presmably an oostegal anlage. In the third juvenile stage, the operculum is more heavily keeled and setose and preliminary oostegite buds are visible on the coxae of pereopods I–IV. There are 2 adult female stages: preparatory and brooding. Preparatory stage 7 females exhibit partially developed oostegites and a keeled, setiferous operculum. The 8 measured individuals range widely in size, suggesting that they reach the preparatory condition more than once in their lifetime, possibly alternating between the preparatory and brooding condition as seen in the Desmosomatidae (Hessler, 1970). Unfortunately, this hypothesis cannot be tested because no intact brooding females were sampled at this station.

TABLE 2. Range of variation of body length, number of articles in first antenna, number of setae on apical article of mandibular palp, and number of denticles on inner margin of fifth article of maxilliped is given for each of the apparent postmarsupial developmental stages, both ♂ and ♀, of *Bellibos buzwilsoni*. All specimens are from a single station, WHOI 321. **See text for discussion.**

Stage/sex	*N*	Mean body length ± 1 SD (mm)	No. articles antenna I (left, right)	No. setae apical article mandibular palp (left, right)	No. denticles fifth article maxilliped (left, right)
Manca 1 ♂♀	5	1.92 ± 0.08	(7, 7)	(5–6, 6)	(4, 4)
Manca 2 ♂♀	60	2.40 ± 0.09	(7, 7)	(5–6, 5–6)	(3–5, 3–5)
Manca 3 ♂	15	2.91 ± 0.11	(7–8, 7–8)	(6–8, 6–8)	(4–7, 4–6)
Manca 3 ♀	17	3.03 ± 0.26	(7, 7)	(4–8, 6–7)	(4–7, 4–6+)
Juvenile 1 ♂	43	3.30 ± 0.15	(9–12, 8–12)	(5–9, 5–8)	(5–7, 4–8)
Juvenile 1 ♀	21	3.53 ± 0.14	(7, 7)	(0–11, 7–11)	(5–10, 5–10)
Copulatory ♂	6	3.97 ± 0.74	(12–23, 14–23)	(9–15, 7–16)	(6–9, 7–9+)
Juvenile 2 ♀	2	4.20 ± 0.00	(–, 7)	(9–10, 9)	(8–10, 7)
Juvenile 3 ♀	5	5.55 ± 0.13	(7, 7)	(10–11, 10–11)	(9–10, 9–10)
Preparatory ♀	13	6.44 ± 0.59	(6–8, 6–8)	(6–12, 9–12)	(9–12, 10–14)

The morphological characters studied for variability include the number of articles in the first antenna, the number of setae on the apical article of the mandibular palp, and the number of denticles on the fifth article of the maxilliped. These characters are frequently used in the syneurycopine literature, usually without regard to their variability. The data are tabulated by stages in Table 2. The number of articles in the first antenna does not vary much in females from the earliest developmental stage to adulthood; the number increases with development in males, as does the variability. The number of setae on the apical article of the mandibular palp varies with sex in most syneurycopine species; *B. buzwilsoni* is an exception because both sexes possess well-developed mandibular palps with numerous setae. The number of setae increases allometrically, with individual variation. Lastly, the number of denticles on the inner edge of the third article of the maxillipedal palp also varies both allometrically and individually (see Table 2). The wide range of values found for each of the above characters indicates the low value of these meristic characters in diagnosing syneurycopine species. We continue the practice of presenting meristic counts and morphological measurements of single specimens in this paper because the sample sizes are usually too small to obtain significant ranges; one should regard the quoted value as a representative number, keeping in mind the potential for variability. However, in the diagnosis and additional description of *B. buzwilsoni*, we present the known range of a given character rather than a single type measurement because we have the variability data.

Characteristically, females are larger than the corresponding stage of males; the difference is amplified by increasing development. In both sexes, development progresses gradually; the final size discrepancy of adults is then a result of the greater number of female instars and possibly greater incremental growth of females. The *B. buzwilsoni* illustrated preparatory female (Fig. 7) is far smaller than the average size of preparatory females at WHOI 321, suggesting the possibility of geographical variation; WHOI 321 is in the northeastern Atlantic, the diagnosed female is from WHOI 66 on the Gay Head–Bermuda transect in the northwestern Atlantic Ocean. Two such distant populations, separated by the mid-Atlantic ridge may well diverge in certain characters.

Bellibos (*Bellibos*) *dageti* (Chardy), 1975
Figures 9 and 10

Synonymy.—*Syneurycope dageti* Chardy, 1975, pp. 695–698, Figs. 5–6.

Holotype.—Campagne Biogas IV Station 2 (47°31′N, 9°09.7′W); missing from National Museum of Natural History, Paris; ♀, 4.2 mm.

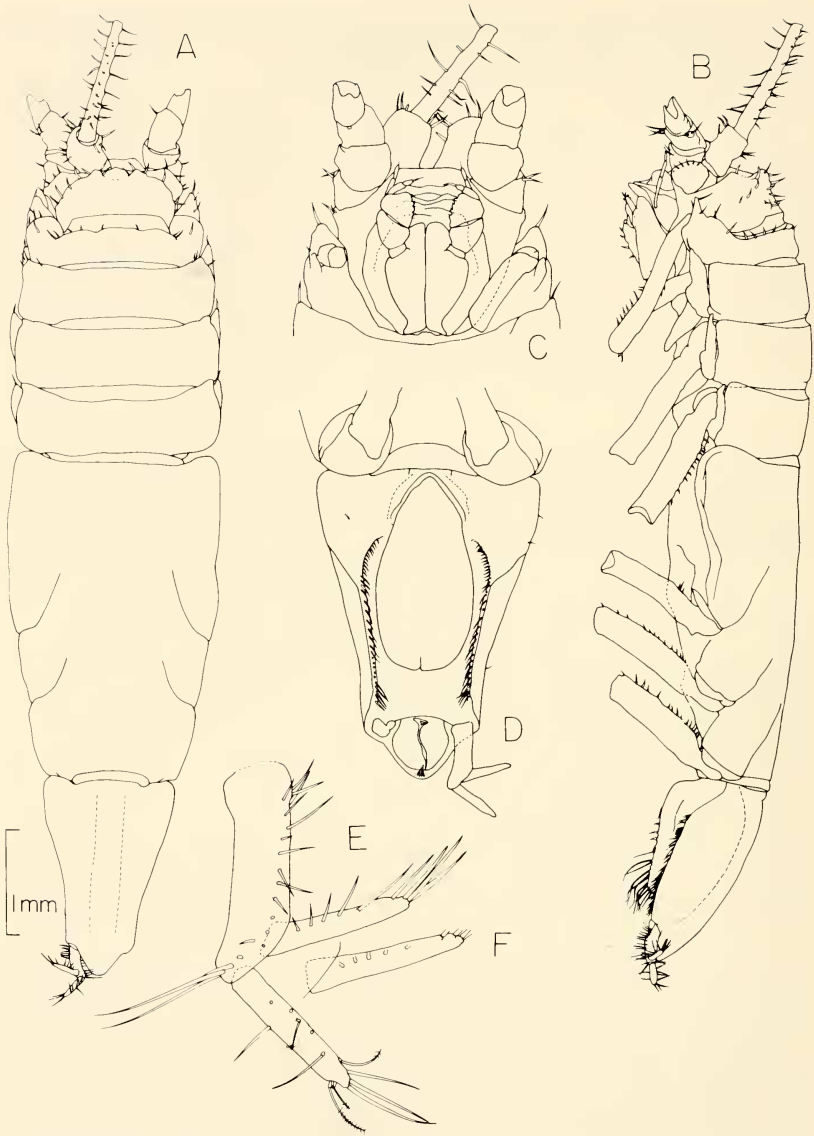

FIGURE 9. *Bellibos* (*Bellibos*) *dageti* preparatory ♀ no. 1, Allen 50: A. body, dorsal view; B. body, lateral view; D. pleotelson, ventral view, setae omitted from operculum and uropod, right uropod missing; E. left uropod, ventral view, *in situ*, exopod foreshortened; F. uropodal exopod, full length. Immature ♂ no. 3, Allen 50: C. cephalon-pereonite 1, ventral view.

Other material.—Present collection. WHOI stations 155 (6 individuals); 328 (31); 156 (7); 288 (4); 71 (1); 100 (1); 126 (12); 330 (2). J. Allen station 50 (21). Diagnosed preparatory ♀ no. 1 (Allen 50) USNM 173009; illustrated preparatory ♀ no. 2, immature ♂ no. 3, copulatory ♂ no. 4 (Allen 50) and copulatory ♂ no. 5 (WHOI 328), USNM 173010, USNM 173012, USNM 173011, and USNM 173013, respectively; preparatory ♀, ♂ fragment (WHOI 328) and juvenile ♀ (J. Allen 50) deposited at ZMUC.

Distribution.—Eastern and western Atlantic Ocean, 50°43.4′N to 0°46.0′S, 2379–4892 m.

Diagnosis.—*Bellibos* with flat, fusiform body; body length 3.8–4.1 (preparatory ♀), 3.9 (copulatory ♂) × tergal width of pereonite 2. Single pair of cephalic horns present, blunt-tipped and setose; cephalon not greatly expanded in length dorsally relative to first pereonite. Pereonite 1 embraces cephalon dorsolaterally; anterior edge fringed with simple setae. Pleotelson width at level of uropod insertion ½ that of proximal end. Antenna 1, second article unusually elongate, up to 3× that of first, and setiferous; flagellum unknown. Mandibular incisor process may bear from 5 to 10 teeth; ♀ palp with reduced apical article bearing single seta; apical article ♂ palp well developed with 8 setae. Maxilliped with numerous large, unequally bifid setae on ventral surface of basipodite and along outer distal edge of epipodite; epipod pointed distally. Pereopods I–IV with well-developed coxal plates, pointed anteriorly each with an apical seta; bases of subequal length. Unequally bifid setae present along posterior edge of pereopod I–IV bases and anterior edge of pereopod V–VII bases. Pereopod VI carpus l/w 1.6. Main part, ♀ operculum oval; keel moderately developed with unequally bifid setae present along ridge. Pleopod 1, ♂, outer ramus of distal end vestigial. Uropodal protopod elongate and slender; exopod subequal in width to endopod.

Additional description.—Body length 4.2–7.7 mm preparatory ♀, width 1.0–1.9 mm; body length copulatory ♂ 5.1 mm, width 1.3 mm. Body widest at pereonites 3 and 4. Pereonite 2 l/w 0.3 in adults of both sexes. Antenna 1, second article l/w ≈8.

Remarks.—*Bellibos dageti* is characterized by a combination of unique traits: blunt and setiferous cephalic horns; first pereonite which laterally embraces cephalon; unusually elongate second article of first antenna; anteriorly pointed, well-developed pereopod I–IV coxal plates; uropodal rami of equal width. The large natasome in combination with the flat, fusiform body shape is unique within the subfamily.

The species was first described by Chardy (1975) on the basis of a single female specimen; unfortunately, this holotype was apparently lost in transfer to the Paris Museum (P. Chardy, *personal communication*). This loss is a real misfortune because, although our specimens (85 individuals of both sexes from 9 North Atlantic localities, 3 of which are in the vicinity of the type-locality) are very similar to the illustrations and description of the holotype, a close comparison reveals problematical differences.

The holotype is said to possess a mandible with a globular incisor process bearing "some ten denticles"; our described specimen (preparatory ♀ no. 1) bears 5 very distinct teeth. The holotype is 4.2 mm long and 1 mm wide at pereonite 4 (both measurements according to text of original description; use of scale line included with Chardy's figure yields a length of 1.5 mm). Our specimen is 7.7 mm long and 1.9 mm wide, almost twice as large as the holotype. This discrepancy may be due to ontogenetic variability. It is a preparatory female, but the maturity of the holotype is unknown. If the holotype is indeed an adult female, such a large size difference becomes as difficult to account for as the difference in the number of incisor teeth. These differences are not likely the result of geographical variability because both specimens come from the same ocean basin. The possibility exists that we are dealing with 2 discrete species characterized by size and the number of mandibular incisor teeth, but the reality of these differences is not well enough established to justify describing a new species at this time. Only one other difference was noted: the operculum of the holotype is illustrated without an apical cleft; all other syneurycopine specimens including the above specimen possess such a cleft. This character is, however, easily overlooked.

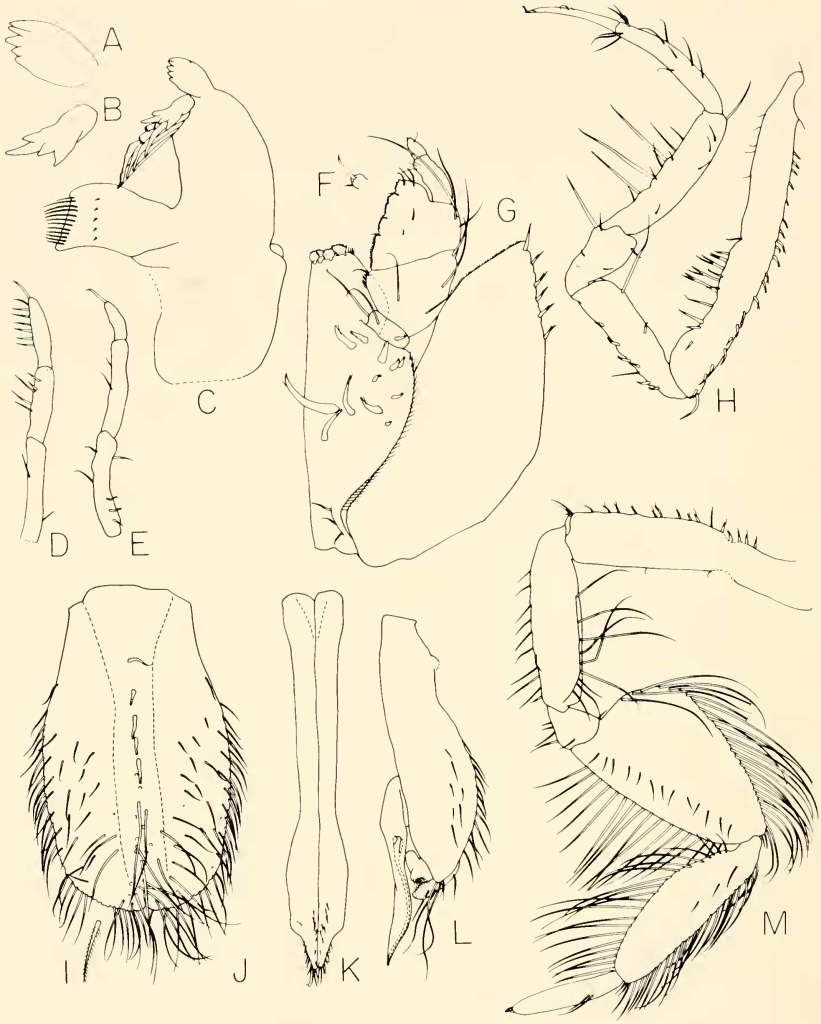

FIGURE 10. *Bellibos* (*Bellibos*) *dageti* preparatory ♀ no. 2, Allen 50: A. incisor process, mandible, plan view; B. lacinia mobilis, mandible, plan view; C. left mandible, mandibular palp obscured in this view; E. left mandibular palp; F. tip of distal joint of right maxillipedal palp; G. left maxilliped, distal joint of palp damaged; H. left pereopod I, *in situ*; M. left pereopod VI, *in situ*, long setae are all plumose, basis slightly damaged. Preparatory ♀ no. 1, Allen 50: I. plumose seta, enlarged view, typical of long, slender setae on operculum; J. operculum. Copulatory ♂ no. 5, WHOI 328: D. left mandibular palp. Copulatory male no. 4, Allen 50: K. pleopods I; L. left pleopod II, long setae are plumose.

The species is redescribed and illustrated from specimens in our working collection. From this material, it has been possible to describe a number of traits unrecorded in the original description, including the length of pereopod I–IV bases and the condition of males. Because there is no intact fifth pereopod on any of the mature speci-

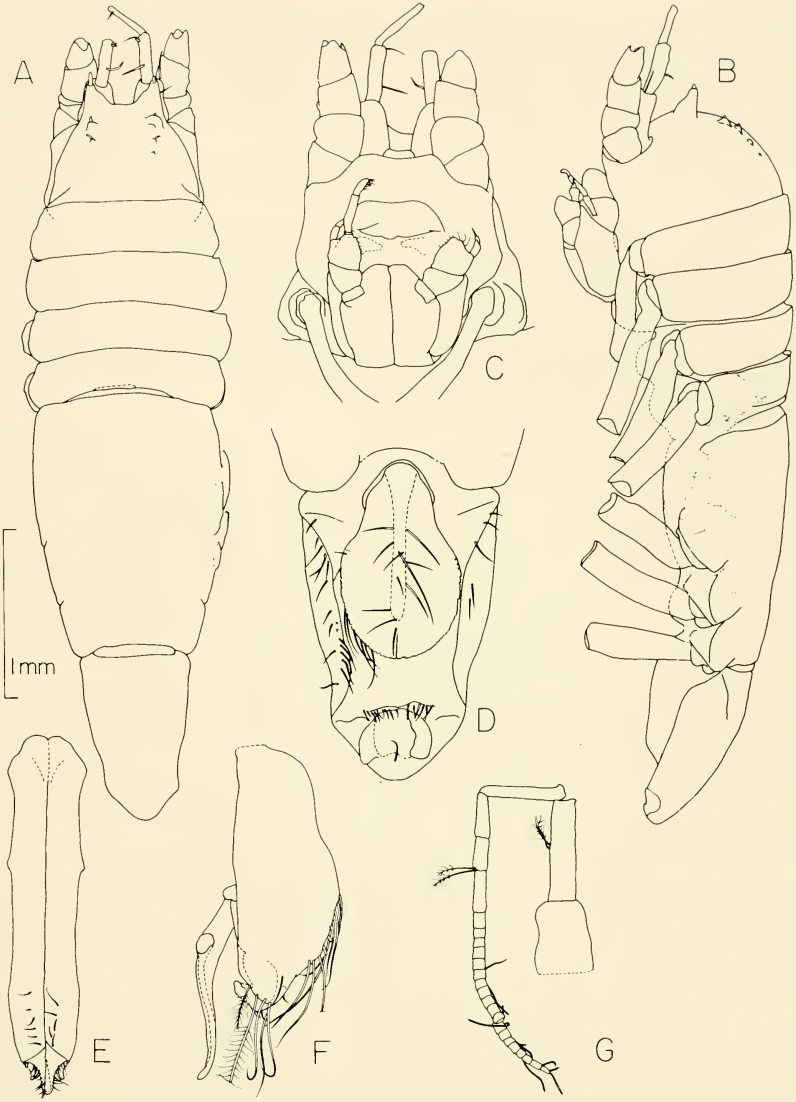

FIGURE 11. *Bellibos* (*Bellibos*) *multispina* nonpreparatory ♀, allotype (AMNH 12094): A. body, dorsal view, posterior pereonites damaged; B. body, lateral view, posterior pereonites damaged; C. cephalon-pereonite 1, ventral view; D. pleotelson, ventral view, marginal setae of operculum and left medial edge not illustrated, uropods absent. Paratype ♂ (AMNH 12095): E. pleopods I, *in situ*. Holotype ♂ (AMNH 12093): F. left pleopod II, *in situ*, all setae are plumose; G. left antenna I, *in situ*.

mens, the sixth is treated instead. Throughout the subfamily, the sixth pereopod is similar in shape to the fifth, although its dimensions are slighter.

Sexual dimorphism with respect to the antenna I flagellum remains unknown in *B. dageti*; the antenna is usually broken off at the junction between articles 2 and 3. However, the fact that the mandibular palp is sexually dimorphic suggests a parallel dimorphism for the first antenna.

Bellibos (*Bellibos*) *multispina* (Menzies), 1962
Figure 11

Synonymy.—*Syneurycope multispina* Menzies, 1962, pp. 151–153, Fig. 42E–K.

Holotype.—L.G.O. Biotrawl no. 52 (41°03′S, 07°49′E); AMNH 12093; ♂, 4.3 mm. Specimen in poor condition; head detached from body; right antenna I and pleopod II present; no pereopods or mandibular palp.

Other material.—Female allotype, 4.2 mm, AMNH 12094: fair specimen with some cuticular damage; without oostegites; pereopods, antennae missing. Male paratype, AMNH 12095: specimen without pleotelson; pleopods I and single pleopod II present; no pereopods or mandibular palp.

Distribution.—Southeastern Atlantic Ocean, 41°03′S, 4960 metres (known only from type locality).

Diagnosis.—*Bellibos* with anteriorly deep, robust body; body length 3.6 (♀, allotype), 3.4 (♂, holotype) × tergal width of pereonite 2. Cephalon greatly expanded in length dorsally, at least 2× length pereonite 1; longitudinal row of spines present on either side of midline: anteriormost spines largest, decreasing in size posteriorly; number of cephalic spines variable; each spine tipped with seta. Pereonite 1 not embracing cephalon dorsolaterally; pereonites 1–4 free of setae. Pleotelson width at level of uropod insertion ≈⅔ width at proximal end. Antenna I, second article <1.5× length first article, setae few; ♂ antenna I with ≈25 articles, number unknown for ♀. Female mandibular palp with robust apical article bearing 6 setae, unknown for ♂. Number of mandibular incisor teeth not recorded. Maxilliped with slender, simple setae; epipod unknown. Pereopods I–IV with undeveloped coxal plates; bases subequal in length, without stout setae; pereopods unknown beyond basis. Female operculum pear-shaped; moderately developed keel present with slender setae. Pleopod I, ♂, outer ramus of distal end well developed. Uropods unknown.

Additional description.—Body length ♀ (allotype) 4.2 mm, width 1.2 mm; body length ♂ (holotype) 4.3 mm, width 1.3 mm. Body widest at pereonites 2 and 3; pereonite 2 l/w 0.3 ♂ and ♀. Antenna I, second article l/w <4.0.

Remarks.—The most distinctive feature of *Bellibos multispina* is the double row of spines on the dorsal surface of the expanded cephalon (Figs. 11A and 11B). The number of spines does not appear to be fixed for the species, as the 3 type-specimens all exhibit different numbers of spines. Furthermore, on any single specimen the number of spines in the 2 rows need not be equal; the counts for the allotype, paratype, and the holotype are: 3L/5R, 4L/5R, 5L/6R, respectively (L = left, R = right).

This species is only known from the type-specimens. They comprise 2 adult males and 1 female whose maturity is difficult to ascertain because it does not possess oostegites. (Menzies incorrectly refers to 2 females and 1 male in the original description.) We have reillustrated certain views where helpful. The mandible and maxilliped, dissected presumably from the holotype and illustrated by Menzies, have been subsequently lost; no further dissection of the type-material was attempted. Unfortunately, the pereopods and uropods remain unknown.

Bemerria, subgen. nov.
Figures 12 and 13

Type species.—*Bellibos* (*Bemerria*) *monicae* (Chardy), 1975, pp. 698–701, Figs. 7–9.

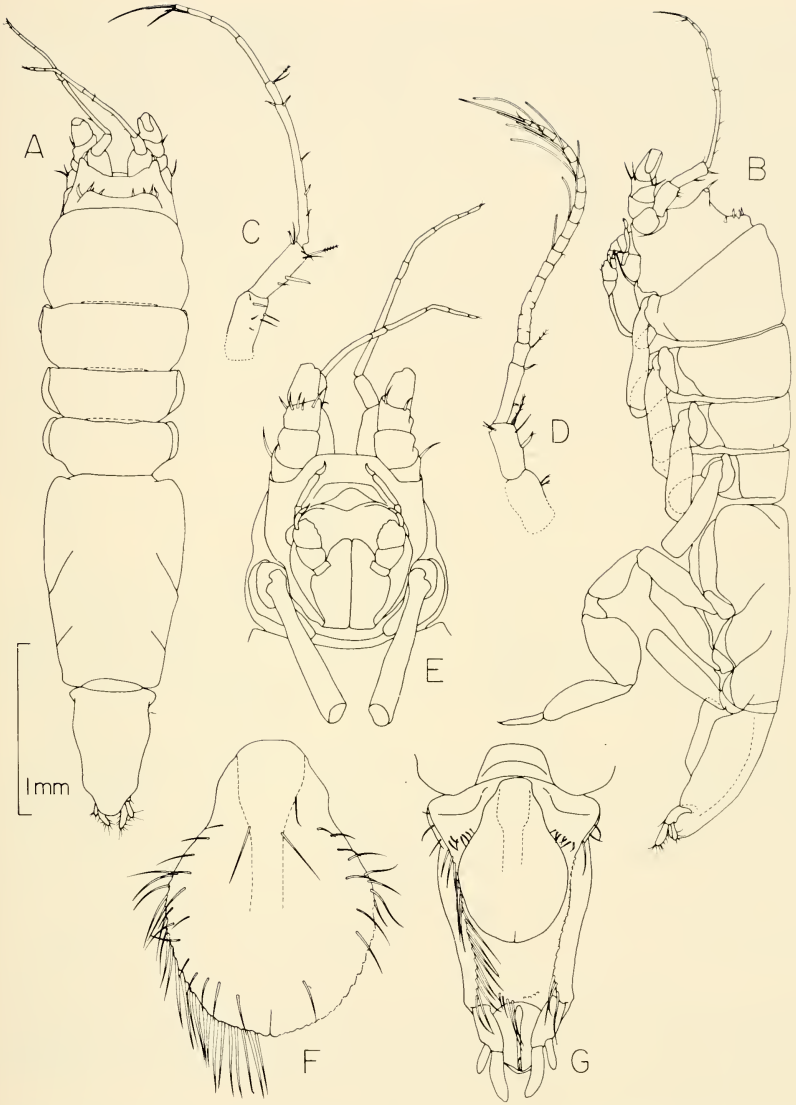

FIGURE 12. *Bellibos* (*Bemerria*) *monicae* preparatory ♀, WHOI 195: A, body, dorsal view; B, body, lateral view, setae omitted from appendages; C, left antenna I, lateral view, *in situ*; E, cephalon-pereonite 1, ventral view; F, operculum, setae omitted from left margin, all setae are plumose; G, pleotelson, ventral view, setae omitted from operculum, left medial edge of pleotelson and uropods, all setae are plumose. Copulatory ♂, WHOI 156: D, left antenna I, lateral view, *in situ*.

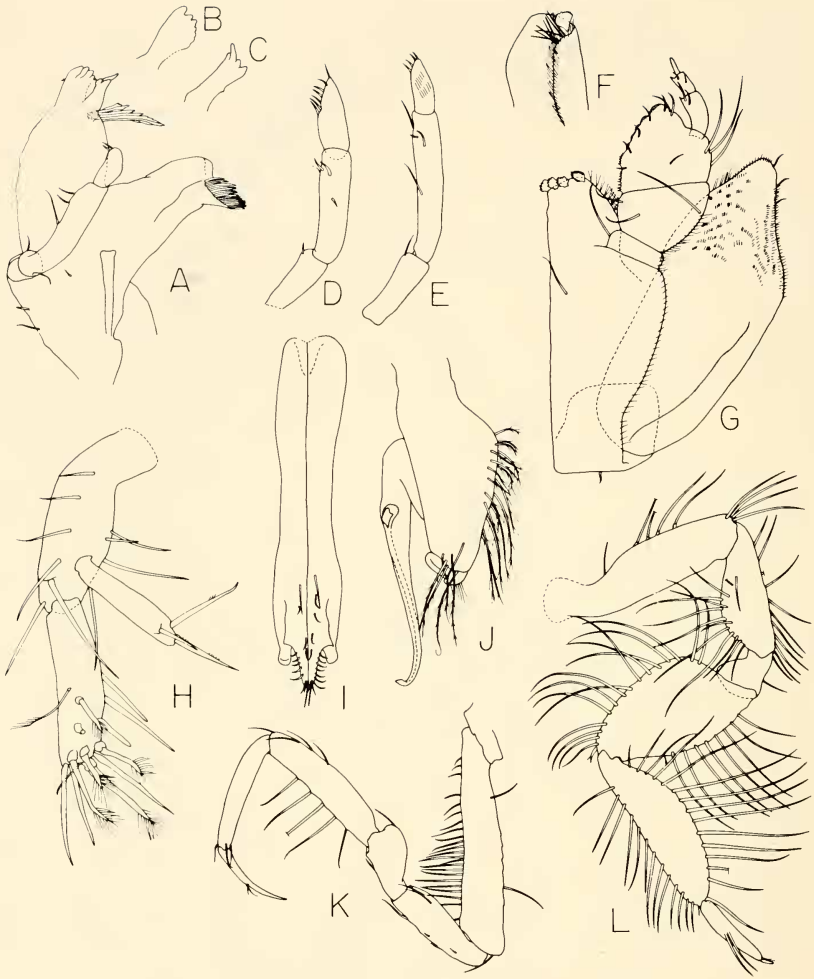

FIGURE 13. *Bellibos* (*Bemerria*) *monicae* preparatory ♀, WHOI 195: A. left mandible; B. incisor process, mandible, plan view; C. lacinia mobilis, mandible, plan view; E. left mandibular palp; F. distal edge, maxillipedal endite, dorsal view; G. left maxilliped; H. left uropod, lateral view, *in situ*, endopod foreshortened; L. right pereopod V, *in situ*. Copulatory ♂, WHOI 156: D. left mandibular palp, *in situ*; I. pleopods I; J. left pleopod II. Preparatory ♀, WHOI 72: K. left pereopod I, *in situ*.

Distribution.—Eastern and western Atlantic Ocean, 40°57′N to 72°47.6′S, 2864–4270 m.

Etymology.—In the spirit of the holiday season, during which time the manuscript was completed.

Diagnosis.—*Bellibos* with combined length pereonites 1–4 > pereonites 5–7. Articulation between cephalon and first pereonite reduced. Uropodal exopod ⅔ to ¾ length endopod.

Remarks.—*Bemerria* containing a single species, *Bellibos* (*Bemerria*) *monicae* (*see* ADDENDUM), shares similarities not only with its congeners but with *Syneurycope* as well. It presents a morphology intermediate to the 2 genera. The elongate, slender body shape with the anterior 4 pereonites longer than the posterior 3 is a trait of *Syneurycope*. The reduced articulation between cephalon and first pereonite is only a step away from the complete fusion of these segments exhibited by *Syneurycope*. *Bellibos monicae* is the only member of *Bellibos* in which the uropodal exopod is shorter than the endopod; in *Syneurycope*, this condition is carried to an extreme. The setation of the uropodal exopod is reduced in *Bemerria* to 5 apical setae (the uropod illustrated in Fig. 13H is unusual in bearing only 3 exopodal setae; all other examined specimens bear 5 such setae); *Syneurycope* has only 2. Although the above traits suggest affinity to *Syneurycope*, *Bemerria* possesses more traits in common with *Bellibos*: paired cephalic spines, a multiarticulated first antennal flagellum in both sexes, an expanded pereopod V carpus, a more pear-shaped female operculum, distal end of male pleopod I with shortened outer ramus, male pleopod II with a normally positioned exopod. Furthermore, the fusion of pereonite 1 to the cephalon is a diagnostic trait of *Syneurycope* in this revision, clearly excluding *B. monicae* from *Syneurycope*. Although we choose to include this species with the 3 remaining syneurycopine species in *Bellibos*, the intermediate status of *B. monicae* justifies its isolation in a separate subgenus.

Bellibos (*Bemerria*) *monicae* (Chardy), 1975
Figures 12 and 13

Synonymy.—*Syneurycope monicae* (Chardy), 1975, pp. 698–701, Figs. 7–9.

Holotype.—Campagne Biacores station 245 (40°57′N, 22°16′W): missing from the National Museum of Natural History, Paris; ♂, 4.0 mm.

Other material.—Present collection. WHOI station 195 (2 individuals), 71 (16), 156 (2). Rankin station 1969 no. 23 (1). Illustrated preparatory ♀ (WHOI 195) USNM 173015; illustrated copulatory ♂ (WHOI 156) USNM 173014; illustrated preparatory ♀ (WHOI 72) USNM 173016; ♂ and preparatory ♀ (WHOI 72) deposited at ZMUC.

Distribution.—See subgenus.

Diagnosis.—*Bellibos* with body length 4.5 (preparatory ♀), 3.8–4.8 (copulatory ♂) × tergal width of pereonite 2; anterior half of body deep. Single pair of cephalic horns present, tipped with an apical seta; transverse dorsal ridge poorly to well developed at posterior edge of cephalon, may bear setae. Dorsal length, first pereonite approximately 1.5× that of pereonite 2. Antenna 1 with ≈8 articles preparatory ♀, 19 articles copulatory ♂. Mandibular incisor process bears a few main teeth and an indistinctly serrated posterior edge; apical article of palp with ≈4 setae in adult ♀, up to 7 in adult ♂. Maxillipedal epipod narrow distally. Coxal plates undeveloped on pereopods I–IV; bases subequal in length. Pereopod V carpus l/w 1.4–1.5. Main part ♀ operculum nearly round; keel poorly developed. Male pleopod I, outer ramus of distal end well developed. Uropodal exopod width ≈½ that of endopod.

Additional description.—Body length preparatory ♀ (WHOI 195) 3.7 mm, width 0.8 mm; body length copulatory ♂ 2.7–4.1 mm, width 0.6–1.1 mm. Body widest at pereonite 2; l/w 0.4 preparatory ♀, 0.3–0.4 copulatory ♂.

Remarks.—*Bellibos* (*Bemerria*) *monicae* is best characterized by the expanded first pereonite. Other traits which are unique to this species are: a uropodal exopod approximately ⅔ the length of the endopod; a cephalic ridge which can be developed to various extents. This species was originally diagnosed by Chardy (1975) on the basis of a single male individual taken from the northeastern Atlantic Ocean; unfortunately, this holotype specimen was also lost enroute to the Paris Museum (P. Chardy, *personal communication*). We have redescribed and illustrated the species from a collection of 21 individuals of both sexes which were sampled at 4 stations in the northwestern and southern Atlantic. Although these individuals closely resemble *B. monicae*, comparison to Chardy's literature description and illustrations of the holotype reveal some

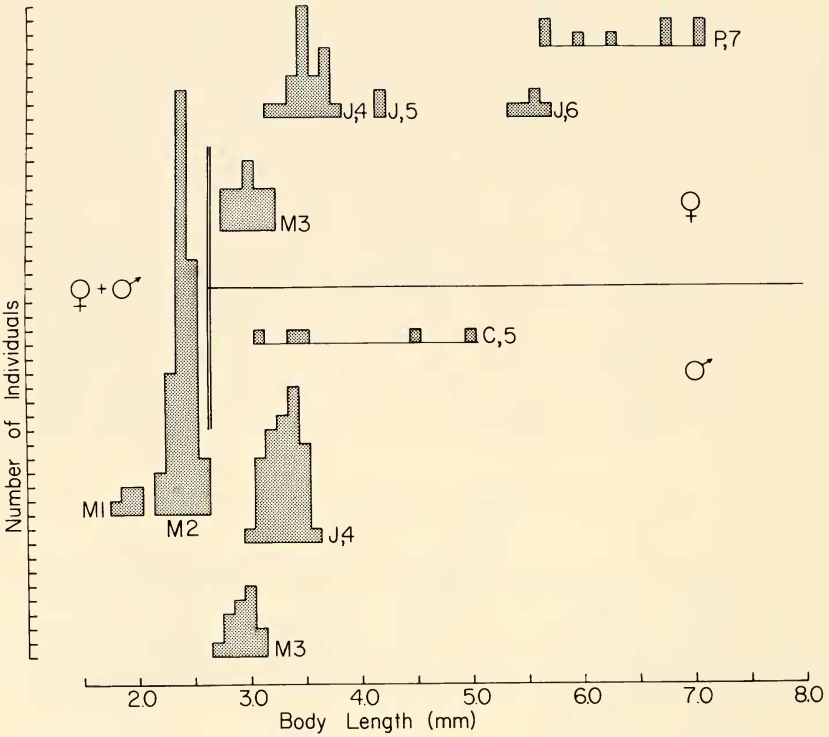

FIGURE 14. Size-frequency histogram of the postmarsupial developmental stages of *Bellibos buzwilsoni* from WHOI station 321. Stages are numbered separately for ♂♂ and ♀♀ and proceed from manca stage 1 (M1) through either preparatory ♀, stage 7 (P,7) or copulatory ♂, stage 5 (C,5). Sexes are first differentiated morphologically at manca stage 3 (M3). See text for discussion. Abbreviations: C, copulatory; J, juvenile; M, manca; P, preparatory. Each unit on vertical frequency scale = 1 individual.

differences which must be considered. Chardy describes the cephalon as fused with the first thoracic segment, yet he illustrates a complete suture line between the 2 segments. Our specimens also exhibit a complete suture line between the cephalon and first pereonite (Figs. 12A and 12B), although the flexibility at this joint appears reduced due to the loss of the arthrodial membrane. In actuality, this joint may be nonfunctional, but the fusion of the 2 segments is not complete because a suture line still separates them. In contrast, *Syneurycope* demonstrates complete fusion of this joint.

The sculpturing on the cephalon and the shape of the expanded first pereonite also differ from Chardy's description and illustration. The illustrated holotype lacks a cephalic ridge; a cephalic ridge may be poorly to well developed as a posterior continuation of the topography of the cephalic spines on our working specimens. The holotype is illustrated with a central anterior projection of pereonite 1; this projection is not evident on our specimens.

We find it premature to diagnose another species on the basis of these differences. It is possible that the holotype possesses a poorly developed cephalic ridge, overlooked by Chardy; and the shape of the anterior edge of the first pereonite could be an artifact of artistic interpretation.

The dentition of the mandibular incisor process and lacinia mobilis of a representative specimen from our collection may differ from the holotype. Chardy cites an incisor process with 4 teeth and lacinia mobilis with 3; our specimen exhibits a lacinia mobilis with the usual 4 teeth and at least 6 incisor teeth: 3 prominent ones followed by a posterior series of bumps which progressively diminish in size, the number of which is difficult to count. Although these could be diagnostic differences, the indistinct nature of the posterior edge of the incisor process, and the fact that Chardy's illustration shows 6 incisor teeth as opposed to the 4 that he cites in the description, make this difference suspect. Furthermore, the lacinia mobilis is illustrated by Chardy in side view, from which angle only 3 of the 4 teeth present would be visible anyway.

The male first pleopod of the holotype appears to differ from our illustration (*see* Fig. 13I; Chardy, 1975, Fig. 9D), but the difference is largely a result of Chardy illustrating the dorsal (inner) surface of the pleopod, while we illustrate the ventral (outer) surface.

The only remaining difference between Chardy's specimen and ours is body size. The holotype is 4.1 mm long and 1.1 mm wide at pereonite 2; body l/w is 3.8; pereonite 2 l/w is 0.3. The copulatory male which we illustrate is only 2.7 mm long and 0.6 mm wide; body l/w is 4.8; pereonite 2 l/w is 0.4. Both specimens appear to be copulatory by the form of the first and second pleopods. The holotype is 1½× larger than our specimen, the latter also appears more slender than the holotype. This size difference is perhaps the most difficult discrepancy to account for because size can be a diagnostic trait if consistent. Unfortunately, our collection (2 males) is too small to substantiate this difference.

Clearly, the loss of the *B. monicae* holotype has created a real problem. The species was described on the basis of a single male, without knowledge of the female or of individual variation. For this reason our samples are very important; they contain representatives of both sexes. The possibility exists that we are dealing with a new Atlantic species apart from Chardy's, but the data are inconclusive. Should the holotype ever be relocated, it would be a simple task to put this uncertainty to rest.

Addendum

We have recently sampled *Bellibos* (*Bemerria*) in the Pacific Ocean. A single brooding female was collected in the eastern equatorial Pacific (9°25.3'N, 151°10.0'W) from a depth of 5175 metres. Although the specimen is damaged, preliminary examination indicates that it is indeed a new species, closely related to *B.* (*B.*) *monicae*. Its overall morphology, including the dorsally expanded first pereonite, resembles *B. monicae* closely. There is a suite of differences, though, that should prove diagnostic of the new Pacific species. The cephalon differs from that of *B. monicae* in several ways: the cephalic horns are smaller in relative size and they are placed further anteriorly on the cephalon; the cephalic ridge is lacking; the maxillipedal epipod is now short and distally rounded, as if to accommodate a change in the shape of the face. Other differences include a more pointed distal end on the pleotelson, a mandibular incisor process bearing some 9 teeth, and a uropodal exopod with 8 setae.

Unfortunately, we did not receive this specimen until our manuscript was nearing completion. Because the specimen is both damaged and a brooding female, we have set it aside until additional material is collected. The existence of a new *Bellibos* (*Bemerria*) species supports the taxonomic scheme presented herein.

Unlike the majority of our material, the Pacific specimen retains its third and fourth pereopods; they are extremely slender and elongate, of similar proportions to those of *Syneurycope*. This is a significant find, and indicates that the presence of extremely elongate pereopods III and IV is a diagnostic feature of Syneurycopinae.

Acknowledgments

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benaller read and commented on the manuscript. This research was supported by National Science Foundation Grant DES 74-21506.

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Key to Known Genera and Species of SYNEURYCOPINAE

1a. Cephalic horns absent; cephalon fused to first pereonite; uropodal exopod minute, < ½ length endopod ..... ***Syneurycope*** spp. 2

b. One or more pairs of cephalic horns present; cephalon not fused to first pereonite; uropodal exopod well developed, >½ length endopod ..... ***Bellibos*** spp., gen. nov. 4

2a. Molar process of mandible curved, lacking setae, modified as a grinding surface ..... *Syneurycope affinis* Birstein

b. Molar process of mandible truncate with marginal row of setae 3

3a. Narrow body; pleotelson complexly contoured, surface topography exaggerated; antenna I, ♀, first article not expanded in width, not fused to second article; uropodal endopod with 2 large apical setae and 2 stout lateral setae ..... *Syneurycope parallela* Hansen

b. Broad body; pleotelson contouring less complex; antenna I, ♀, first article expanded in width relative to second, fused to second article; uropodal endopod with 3 large apical setae and 3 stout lateral setae ..... *Syneurycope heezeni* Menzies

4a. Combined length of pereonites 1–4 > that of pereonites 5–7; uropodal exopod shorter than endopod; first pereonite expanded in length dorsally ... *Bellibos* (*Bemerria*) *monicae* (Chardy)

b. Combined length of pereonites I–4 < that of pereonites 5–7; uropodal rami subequal in length; first pereonite not expanded dorsally ..... *Bellibos* (*Bellibos*) spp. 5

5a. Cephalon expanded in length dorsally; multiple paired horns on dorsal surface of cephalon ..... *Bellibos* (*Bellibos*) *multispina* (Menzies)

b. Cephalon not expanded; single pair of cephalic horns 6

6a. Flat, fusiform body; cephalic horns blunt, setose; pereonite 1 embraces cephalon dorsolaterally; second article, first antenna unusually elongate, >2× length of first article; anteriorly pointed coxal plates present on pereopods I–IV; pereopod I–IV bases subequal in length; uropodal rami subequal in width ..... *Bellibos* (*Bellibos*) *dageti* (Chardy)

b. Robust, deep body; cephalic horns sharp, lacking apical setae; pereonite 1 not embracing cephalon dorsolaterally; second article, first antenna <2× length first article; pereopodal coxal plates undeveloped; bases of pereopods III and IV substantially shorter than bases of pereopods I and II; uropodal exopod nearly twice the width of endopod ..... *Bellibos* (*Bellibos*) *buzwilsoni*, sp. nov.